

At Monach, on November 15, at 12.43 P.M., the barometer was 29.703; 9 P.M., 29.051; 11 P.M., 28.807 inches; after which it began to rise, and at 9 A.M. of the following morning it had risen to 29.828 inches, a fluctuation of nearly two inches having taken place during the twenty hours ending 9 A.M. of the 16th. The storm accompanying this depression of the barometer rose at 10.30 P.M., about the time of lowest pressure to the force of a true hurricane, the worst the observer had ever seen during his twenty years' service as a lightkeeper. At the same dates, at Thorshavn, Farö, the readings of the barometer were—lowest at midnight of the 11th, 28.119 inches; 15th, at 9 A.M., 29.002 inches, and at 9 P.M., 29.350 inches, the barometer thus rising a third of an inch in Farö during the time that it fell about an inch in the outer Hebrides, accompanied by a storm of extraordinary violence, being the heaviest storm experienced in the north-west of Scotland generally for very many years.

CUMULATIVE TEMPERATURES.—To simplify the difficulty of obtaining sums of temperature (a highly important climatological factor, particularly in its application to agriculture) for any district, from the ordinary instruments, M. von Sterneck has recently proposed to obtain these indirectly by observation of the sums of actions produced by the temperature. A suitable apparatus for this we have in the pendulum-clock. The course of this represents the sums of the heat-changes, since it represents the sum of the changes of length of the pendulum, produced by different temperatures, which changes cause variations in the time of oscillation. As the laws of pendulum vibrations and the expansion of substances through heat are known, the true sums of temperature can be deduced from the going of the clock. While the watch-maker is concerned to obtain as uniform working as possible, and uses arrangements to compensate the changes in length of the pendulum, the present case requires that these changes should be brought into prominence; so the pendulum is made of some substance (like zinc) which expands greatly through heat. The clock will reveal the variations of temperature by its slowness or fastness, and by comparing its indications, at certain times, with those of a uniformly-going clock, the sum of divergences of the temperature from any given temperature will be ascertained. The principle of this method can also be applied (as the author shows) to determine the variations in atmospheric pressure and in the intensity of magnetism.

GEOGRAPHICAL NOTES

BRAZIL.—Mr. Herbert H. Smith has returned to Baltimore, U.S., after an absence of several years employed in scientific explorations in Brazil. Leaving the United States in January, 1874, for Pará, he ascended the Amazon to Santarem, where he was engaged for two years in collecting and studying the insect fauna of that region. Subsequently he extended his explorations to the north side of the Amazon and on the tributary rivers, as far as the base of the great northern table-land. A collection of insects made by him during this period amounted to 12,000 species, with 100,000 specimens, accompanied by copious notes on the habits, geographical distribution, &c. During 1876 and the early part of 1877 he was connected with the Brazilian Geological Commission in examining the geological structure of the country. He succeeded in making a section of the Devonian rocks of the Amazon region, and discovered a rich carboniferous bed on the north side of the Amazon, in the vicinity of Alenguer. The results of this labour are in the course of publication by Prof. Hartr, of the Geological Survey. Several months of his absence were spent in the southern part of Brazil, near Rio de Janeiro and Minas. Mr. Smith has been able to make some interesting inferences in regard to the geological distribution of Brazilian animals. Bates and

Wallace have pointed out that the Amazon forms a limit to the migration of many animals. Mr. Smith is of the opinion that the flood plains of the valley, which average forty miles in width, constitute a far more effectual barrier than a body of water of the same breadth. Birds and insects of powerful flight pass this distance without difficulty, and are generally found on both sides; but the sluggish species, especially the wingless forms, like spiders, are generally confined to one side or the other. This is especially shown in those hymenopterous species in which the females are wingless, as the mutillarias, pezomactri, &c. Here the distinction between the northern and southern groups is very striking. The broad alluvial belt through which the Amazon flows constitutes a very distinct zoological province, in which many of the forms appear to have been derived from those of the high land. The contributions of Mr. Smith to geographical knowledge have not been inconsiderable. His maps of the physical geography of the Lower Amazon and of three important tributaries, the Curna, the Mæcurú, and the Jaurucú, are especially noteworthy. The last-mentioned has been entirely lost sight of by modern geographers, though referred to by earlier travellers. This enters the delta of the Xingú close to the Amazon, and is apparently navigable for steamers to a distance of 150 miles from its mouth. Mr. Smith returns to the United States for the purpose of making arrangements for continuing his explorations for several years longer, so as to accumulate a sufficient body of facts to work out satisfactorily the entire problem of the derivation and the geographical distribution of the insects of Brazil.

AFRICA.—Herr Schütt, who has been despatched by the Deutsche afrikanische Gesellschaft to equatorial Africa, has safely arrived in San Paul de Loando, and starts at once for the interior to complete the work of exploration commenced by Eduard Mohr, whose untimely fate we lately recorded. The series of geographical lectures in Berlin, delivered under the auspices of the Afrikanische Gesellschaft, was opened on January 23, by Dr. Nachtigal, who gave a graphic description of the African kingdom Darfur, which was conquered in 1874 by the Egyptians.

ARCTIC EXPLORATION.—We learn from *L'Explorateur* that Mr. Gordon Bennett, of the *New York Herald*, intends to equip an expedition for polar exploration.

THE ANGARA.—At its last meeting, February 5, the Section of Physical Geography of the Russian Geographical Society discussed the question of the expedition to be sent for the exploration of the Angara and of the water-divide between the Obi and Yenisei rivers, where, it is expected, a water communication could be established between the two main rivers of Siberia. An elaborate report was read, being a sketch of the present state of our knowledge of these tracts, and of the recent explorations of the water-divide; the route the expedition will have to follow was also discussed.

AN AZIMUTH INSTRUMENT.—Capt. Mouchez has presented to the Geographical Society of Paris a portable instrument for taking azimuths and altitudes in travelling. The weight is only a few pounds, and the experiments made at Montsouris show that the latitude can be taken with an error of a few minutes. This instrument is to be used by some travellers that the Paris Geographical Society is sending out to Africa. A single man can carry the apparatus and use it without losing much time. A complete observation requires less than a quarter of an hour.

NOTES

At the meeting of the Linnean Society on Thursday last, it was unanimously resolved to send a congratulatory letter to von Siebold on the occasion of his jubilee. This graceful act, however, brings into prominence the neglect of the Society to take

any notice of the Linnean centenary, the celebration of which in Sweden, Holland, and Germany, were recently noticed in our columns. Of course the excuse may be urged with some force that such formalities are foreign to English habits, but perhaps an exception might have been allowed in the case of a Society which bears the name and jealously guards the collections, books, and manuscripts of the great naturalist. Perhaps, however, another reason may be found in the fact that the constitution of the Society places the initiative in every case in the hands of the officers whose tenure of office is practically indefinite, and who are not very accessible to any impulses of enthusiasm from the general body of the Society even if there were any permissible way by which expression could be given to them. Some disquieting rumours as to the present condition of the Society's business affairs, coupled with its rather troubled history during the past few years, seem to point to the desirability of some changes in its mode of government which would bring the executive into closer relation with the general body of Fellows.

WE gave last week a list of the grants just made from the research fund of the Chemical Society; we are glad to state that since making these grants the fund has been increased by the following donations and subscriptions from the "Alkali Manufacturers' Association." The donations, amounting to 229*l.*, are from Messrs. Charles Tennant and Co., 45*l.*; Messrs. J. and L. Pattinson and Co., 35*l.*; Messrs. R. Bealey and Co., 15*l.*; Messrs. Roberts, Dale and Co., 5*l.*; Messrs. James Muspratt and Sons, 35*l.*; Mr. A. G. Kurtz, 50*l.*; Mr. Henry Baxter, 25*l.*; Mr. C. J. Schofield, 5*l.*; Mr. Thomas Walker, 9*l.*; Mr. D. McKechnie, 5*l.* The following are the annual subscriptions to be continued for five years:—Messrs. Gaskell, Deacon, and Co., 11*l.* 14*s.*; Messrs. Chance Brothers and Co., 4*l.*; The Netham Chemical Company, 4*l.*; W. Pilkington and Son, 7*l.*; Mr. James McBryde and Co., 3*l.*; W. Gossage and Son, 4*l.* 10*s.*; Watson, Kipling, and Co., 2*l.* 18*s.*; amounting altogether to 37*l.* 2*s.*

THE President of the Institute of Chemistry of Great Britain and Ireland offers two prizes of 50*l.* each, to be awarded by the Council of the Institute on February 1, 1879, for the two best original investigations involving gas analysis, and conducted by an associate of the Institute. The investigations must have been made within two years of the date of the award, and must not have been published, if at all, more than six months previous to the award. The prizes will not be awarded unless, in the opinion of the Council, the work is of sufficient merit to qualify the candidate for Fellowship of the Institute.

IN his interesting communication on the analogy between chemistry and algebra in our last number, Prof. Sylvester attributes the conception of *valence* or *atomicity* to Kekulé. No doubt the theory in its present developed form owes much both to Kekulé and Cannizzaro; indeed, until the latter chemist had placed the atomic weights of the metallic elements upon a consistent basis, the satisfactory development of the doctrine was impossible. The first conception of the theory, however, belongs to Frankland, who first announced it in his paper on Organo-metallic Bodies, read before the Royal Society on June 17, 1852. After referring to the habits of combination of nitrogen, phosphorus, antimony, and arsenic, he says, "It is sufficiently evident, from the examples just given, that such a tendency or law prevails, and that, no matter what the character of the uniting atoms may be, the combining power of the attracting element, if I may be allowed the term, is always satisfied by the same number of these atoms." He then proceeds to illustrate this law by the organo-compounds of arsenic, zinc, antimony, tin, and mercury. In conjunction with Kolbe, Frankland was also the first to apply this law to the organic compounds of carbon; their paper on this subject, bearing

date December, 1856, having appeared in Liebig's *Annalen* in March, 1857, whilst Kekulé's first memoir, in which he mentions the tetrad functions of carbon, is dated August 15, 1857, and was not published until November 30 in the same year. Kekulé's celebrated paper, however, in which this application of the theory of atomicity to carbon was developed, is dated March 16, 1858, and was published on May 19, 1858. On the other hand, the "chemicographs," or graphic formulæ, which Prof. Sylvester has so successfully applied to algebra, were the invention of Crum Brown, although Frankland has used them to a much greater extent than any other chemist.

AT the General Meeting of the Royal Astronomical Society, on February 8th, the Gold Medal was awarded to Baron Dembowski for his double-star measurements.

WE learn from the *Diário de Campinas* of the death in that town, on December 20, 1877, of Joaquim Corrêa de Mello, a Brazilian botanist, who was well known as a correspondent to many scientific men in the Old World.

THE Rev. Andrew Bloxam, M.A., rector of Harborough Magna, Rugby, formerly incumbent of Twycross, Leicestershire, died on February 2, aged 76. He was well known to British botanists, especially as a diligent student of brambles and roses.

A SUBSCRIPTION has been opened at Paris with the view to erect a monument to the late M. Raspail.

AMONG the exports of Corsica it is said that there are annually between 350,000 and 400,000 blackbirds (*merles*) which are sent to this continent. They visit Corsica in vast numbers each winter to feed on the berries of the myrtle and arbutus, with which the mountains are covered. In the month of December they become very fat, and the flavour and perfume given to their flesh by their food cause them to be much esteemed by the *gourmets* of Paris. A *pâté de foie de merle* is a great delicacy.

MR. FRANCIS DAY writes that in our notice of Dr. Bleeker last week, seven volumes of his "Atlas" are said to have appeared, whereas the first part of volume 9 has been issued to subscribers, and the second part will be shortly. The number of volumes which the work was intended to fill was twelve, the whole of the MSS. for which has been left complete, as well as most of the figures, and we may hope that they may yet be published.

WE are glad to learn that Prof. Abich is preparing a complete edition of his numerous and well-known works on the Caucasus, under the title of "Forschungen in Kaukasus-Ländern." The first fascicule will contain a new paper on the coal-measures of the middle parts of the Araxus valley, with numerous plates; and the second, a description of the Trialet mountain-range and of its volcanic rocks and mineral waters, with a geological map on a large scale.

PROF. LEUCKART has just issued, in Berlin, the first part of his "Bericht über die wissenschaftlichen Leistungen in der Naturgeschichte der niederen Thiere" for 1872-75, the continuation of the reviews which he has hitherto been accustomed to compile at intervals in this department of zoology.

THE Société Centrale d'Apiculture et d'Insectologie has had constructed a pavilion in the Champ de Mars for the purpose of exhibiting in 1878, in the most complete manner, everything relating to the education of useful insects, especially bees, and the means of preservation of all kinds against noxious insects.

QUITE recently we had a band of Nubians in London; a small band of Eskimo are at present encamped in Paris, and now, we hear, that shortly Europe will have an opportunity of viewing a group of Aborigines from the opposite side of America. A number of Tierra del Fuegians are to be brought to Brussels,

where they will be installed in the Zoological Gardens. The enterprising authorities of the Paris Zoological Gardens contemplate, moreover, importing some specimens of North American Indians, their plan evidently being to keep up a kind of anthropological review of the various civilised and semi-civilised peoples of the globe.

THE German War Department has recently carried out some experiments on a large scale with the electric light at Metz, in order to test its practicability for military purposes. One of the largest known electric lanterns was used for the trials, and it was found possible to distinguish small detachments out of rifle-shot with sufficient accuracy to direct on them artillery fire.

THE alarming rapidity with which shortsightedness is increasing among German students formed the subject of a recent debate in the Prussian Parliament. From extended observations made in the gymnasia, it appears that the number of the shortsighted increases from twenty-three per cent. in the first year to seventy-five per cent. in the ninth or last year. The too-frequent custom in Germany of forcing lads to study during the evenings with insufficient light, in ill-ventilated rooms, is undoubtedly a main cause of this widespread evil.

"HEROES of South African Discovery," by M. D'Anvers, that we referred to in our last number, will be published, we understand, next week by Messrs. Marcus Ward and Co. This volume will contain an account of Stanley's expedition, and the accompanying map will show the route taken by that discoverer.

THE Société d'Hygiène of Paris is making arrangements to establish, in the cities and towns of France, chemical laboratories for the purpose of examining articles of food and detecting adulterations or unhealthful constituents. In this respect France is, like Germany, following the example of England, where the value of public analysts has long since been satisfactorily demonstrated.

WHILE of course the thermo-electric pile is the most useful measuring apparatus in investigations on radiant heat, it is possible, M. Violle suggests (*Journal de Physique*) to repeat easily all fundamental experiments with the radiometer; by moving it along the spectrum one may readily show (even with the Drummond light) the distribution of the heat in the luminous part and in the infra-red region. The action of coloured glasses, the absorption of heat by water, in layers of different thickness, and all similar phenomena, can be shown without any difficulty. The beam of light employed falls directly, or after passage through the absorbent substance, on the radiometer, the image of which is, by means of a lens, thrown on a screen. The experiment is very distinct and pretty; it may be rendered more precise by adopting an arrangement for counting the number of turns of the radiometer. M. Violle says he has had constructed by M. Alvergnyat a small radiometer for the purpose; it is placed on a Duboscq projection apparatus; and the turns can be easily counted on the screen.

IN order to determine the ratio of the specific heats of air at constant pressure and constant volume (a value so important for the doctrine of heat), M. Kayser has recently made fresh experiments on the velocity of sound in tubes. He adopted Kundt's method; in tubes of different diameter, air waves were produced by means of a transversely vibrating rod, and the length of these was measured by the dust figures remaining on the tube. Five tubes of different width were used, and three different steel rods. The results of the inquiry are these: (1) The velocity of sound in tubes depends on their diameter and on the pitch of the tones, and the retardation of the sound is inversely proportional to the diameter of the tubes, and the square root of the number of vibrations. (2) The velocity of sound in unconfined space is accordingly at any rate greater than in tubes; these experiments showed it to be greater than 331.646 m. (3) The velocity

of sound in free space can be calculated from that in tubes when two tubes of different width are used; from these experiments the value obtained for it was 332.5 m. (4) From this the ratio of the specific heats of air at constant volume and constant pressure is inferred to be = 1.4106.

THREE experiments, made with a view to find how weak induced currents in the telephone would still suffice to give distinct perceptions by ear, have lately been described to the Vienna Academy by Prof. Sacher, of Salzburg: 1. The closed circuit of the telephone was, for a length of 20 metres, placed parallel with the insulated wire (cloth and wax) of an ordinary telegraph apparatus. The (Morse) signals were given first by means of six, then three, Smee elements. The induced currents gave a distinctly audible effect in the telephone, so that the messages could be understood. 2. The insulated wire was laid bare at two points 20 metres apart, and the ends of a telephone wire 120 metres long, and equally thick, were connected to it at those points. Only a small portion of the current could have passed through the thin wire in the telephone. Yet the tapping was heard with sufficient clearness to enable one to understand the message. (It is an advantage to use a telephone at each ear.) 3. A telephone wire about 40 metres long was connected with the inner thick wire of an ordinary induction coil, and a second telephone line, about 120 m. long, with the outer thin wire. To Prof. Sacher's surprise it was found possible to communicate through the first to the second telephone, and also (somewhat better, it seemed) in the opposite direction; and this nearly as well as with direct connection. The words were perceived more distinctly when two induction-coils were inserted in the same way. The experiment did not succeed with a Ruhmkorff.

THE improvement of the air-pump, which consisted in dispensing with the flask-like receptacle (with stop-cock) as employed by Otto v. Guericke and Robert Boyle, and introducing the much more convenient plate, is generally attributed to Papin. This is shown by M. Gerland (*Pogg. Ann.*, No. 12, 1878) to be a mistake. In Papin's first paper, "Nouvelles Expériences du Vide," &c., which appeared in Paris in 1674, and which in 1686 had become rare (the only two copies of it now extant are in possession of the Royal Society, and in the British Museum library), he describes and gives a figure of the machine with which the experiments were made, and says:—"Monsieur Hugens (*sic*) fit faire cette machine, ensuite celle de M. Boyle, et il apporta divers changemens qu'on remarquera en comparant leurs figures." This machine (whose figure M. Gerland reproduces) is the first which has a plate. Additional proof that Huygens has the credit of the device is furnished by a letter of Huygens himself, and the date at which the improvement was introduced is shown to have been 1661.

THE Paris Jardin d'Acclimatation has just received a pair of those peculiar Siberian hares, which are grey in summer and white in winter, for the purpose of studying the effects of a temperate zone on the changes of colour.

THE first telegraph line of the Chinese Empire has recently been established between the arsenal of Tian Tsin and the house of the provincial governor. The constructor was Mr. Betts, the director of the School of Mines of Tian Tsin. Although the line is only some ten kilometres in length yet its construction marks a new epoch in the administration of the Empire. The Great Northern Telegraph Company, in spite of repeated efforts made at Foo Chow, have not succeeded in obtaining the permission of connecting this port with Amoy by a telegraph cable, and after vainly trying for two years have finally given up the idea. The line of Tian Tsin has, however, been constructed by order of the Chinese Government; and the population offered not the least resistance wherever the telegraph poles were erected. A cable

was required for the Pi-ho river, which intersects the line. The apparatus used are Morse's die-writers worked by *Éclanché* elements. Mr. Betts and some of his assistant pupils have been invited to visit Formosa in order to construct a line on the west coast of this island, viz., between Kee Lung and Tay-wan-foo. It is also proposed to establish another line at Tian Tsin, connecting that city with the capital of the province Paou-ting-foo.

DURING the year 1877 the Parisian press numbered no less than 836 different newspapers and serials (against 754 in 1875). Of these, 51 daily and 14 weekly papers are political, 49 serials are theological (37 Catholic, 10 Protestant, and 2 Israelitic); 66 are dedicated to law, 85 to political economy, 20 to geography, 74 to *belles lettres*; 20 are pedagogic, 52 literary-scientific, 56 artistic, 68 treat of fashions, 77 of technology, 75 of medicine; the contents of 43 are mathematical and natural-scientific, of 22 military, of 31 agricultural. Besides the above there are 16 sporting papers, 13 of various contents, and 4 dedicated to Freemasonry.

MANY alloys of tin and other soft metals hardened by addition of antimony, copper, &c., do not give a clear tone on being struck, but a lead-like, dull one. It has been found by M. Lilliman (*Pol. Notizblatt*) that the power of sounding clearly may be imparted to them, by immersing them for a half to one minute in a paraffin or oil bath, heated to a temperature 5° to 5°·5 below the boiling-point, then taking out and allowing to cool. This does not produce any diminution of density, but a considerable increase of the hardness and rigidity.

THE *Proceedings* of the Bristol Naturalists' Society (vol. ii. part 1, new series) contains, as usual, some papers of more than average value. There are three papers on the microscope by Dr. Fripp, two on the Bristol coalfield by Mr. W. W. Stoddart, besides two other geological papers by the same author, a paper by Mr. W. Evans on the scientific aspects of tanning, and other matters of importance. The *Transactions* of the Bedfordshire Natural History Society for 1876-7 contains a number of good papers on local natural history.

THE gasworks at the Grasbrook at Hamburg have recently been covered with a gigantic iron roof, constructed by the "Essener Union." Its weight is 51,500 kilogrammes, its length 84 metres. With the exception of the roof on the Liverpool gasworks, it is the largest in Europe.

AT the meeting of the Royal Academy of Sciences at Berlin, on January 24, Prof. Du Bois Reymond, as President of the Committee of the Humboldt Institution for Naturalists and Travellers, read a detailed report of the activity of this institution during the past year. The first undertaking was that of Herr J. M. Hildebrandt, and referred to the exploration of the snow-clad mountains of Equatorial Africa, viz., of the Mt. Kenia and of the Kilima-Ndjaru. The well-known traveller, although he approached the former mountain to within a few days' march, could not reach it altogether on account of the unconquerable difficulties placed in his way by the enmity of the native tribes, but he will again take up his plan after having recruited his health at home. Herr Hildebrandt, however, has brought home rich scientific collections from his journey, and has presented them to the scientific societies at Berlin; his geological collections are of special interest. The second traveller sent out by the Humboldt Institution, Dr. Karl Sachs, continued and terminated his investigations on the electric eels (*Gymnotus electricus*) at Calabozo, an important town in the Llanos of Venezuela. He succeeded in adding to our knowledge of *Gymnotus* considerably, so that of this species now quite as much is known as of *Torpedo*; he failed, however, to throw any light upon the development of *Gymnotus*. Dr. Sachs is now occupied in

writing a treatise on this subject, as well as a description of the country and the people of Venezuela and his own experiences while travelling.

It is very unsatisfactory to hear that the consignment of soles and turbot which left the Southport Aquarium on January 3 for the purpose of stocking the Bay of Massachusetts has turned out almost a total failure, one pair of the former only having arrived at their destination in safety. 'Prof. Baird, United States Commissioner of Fish and Fisheries, is so anxious to introduce the above-named fishes into American waters that another journey to England is contemplated about May next. Much experience has been gained in the transit of live fish across the Atlantic, which will be of considerable importance in facilitating future arrangements. It is highly probable that the bony pike and other American fishes, many of which are remarkable for their brilliancy of colour, will ere long find a home in English aquaria.

THE additions to the Zoological Society's Gardens during the past week include a Common Swan (*Cygnus olor*) from Holland, presented by Mr. John Colam, F.Z.S.; two Crested Guinea Fowls (*Numida cristata*) from West Africa, presented by Mr. Collingwood; two Canadian Geese (*Bernicla canadensis*) from North America, presented by Mr. Edward J. Philpot; four Reeves's Terrapins (*Clemmys reevesi*) from China, presented by Mr. A. Thomson; a Brazilian Tortoise (*Testudo tabulata*) from Cartagena, presented by Capt. King; a Poitou Donkey (*Asinus vulgaris*) from the south of France, deposited; an Azara's Fox (*Canis azarae*) from South America, purchased.

D'ARREST'S SPECTROSCOPICAL RESEARCHES

WHEN the late Prof. d'Arrest was called to superintend the building of the new observatory in Copenhagen and the erection of a large refractor (16 feet focal length by 11 inches aperture), he took advantage of the opportunity thus offered to enter into more extensive researches on the nebulae, than he had been able to undertake at Leipzig. He intended at first to observe all the nebulae which were visible in his refractor, but he soon found that a work beyond human power, and that in fact the nebulae are infinite in number. Working hard for six years he was only able to collect the eighth part of the observations required for laying down approximate positions of all those nebulae which are distinctly visible in the Copenhagen refractor, and whose places could be exactly determined. These observations were published as "*Siderum nebulosorum observationes Havnienses*," in 1867, for which the gold medal of the Royal Astronomical Society was awarded to him in 1875. Prof. d'Arrest died eight years after the publication of his great work, his health broken down by constant night-watches. These years were spent mostly on spectroscopical researches, which were partly published in the *Astronomische Nachrichten*, partly in a separate paper, "*Undersøgelser over de nebulose Stjerner i Henseende til deres spectralanalytiske Egenskaber*," in 1872. This latter paper does not appear to be so widely known as it deserves, and an abstract in the columns of NATURE might therefore be acceptable to many.

It took D'Arrest several years to get sufficiently acquainted with the use of the new apparatus—so different from those usually handled by astronomers of the old school. Various forms of spectroscopes are employed according to the subject to be examined. To observe the protuberances or their lines the greatest possible dispersion is required in order to weaken on one hand the sun's light, and on the other hand the diffuse atmospheric light which forms the background on which the lines are projected; while prisms of small dispersive power are employed when for instance the bright lines of comets or nebulae are examined. D'Arrest's spectroscope was not intended for any extreme application; it was a so-called Janssen's, after Amici's principle composed of a *vision directe* of three crown and two flint-glass prisms from Merz.

The solar light has lately been made to go twice through the system of prisms, and the dispersive power thus doubled has rendered many more bright lines visible than were known